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SESSION ID: LAB3-W08

Case Studies in Vulnerability Prioritization

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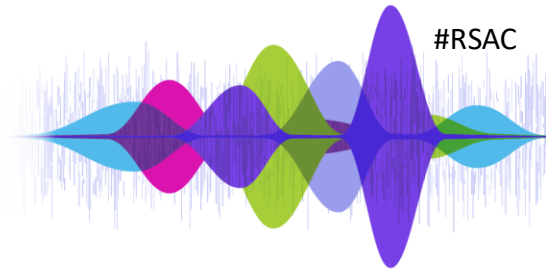

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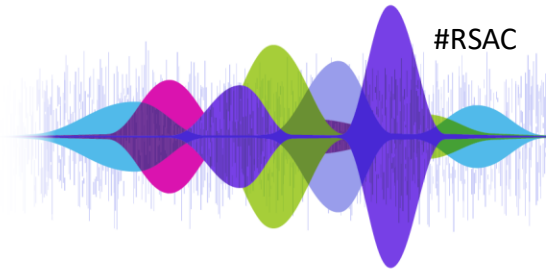

Agenda

- Introductions
- Evaluating a Vulnerability (5Ws)
- Group Discussion
- Case Studies: MOVEit Transfer, Log4j, HAFNIUM/Exchange
- Group Tabletop Exercise
- Vulnerability Databases and Scoring Methods

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Introductions

Share your favorite/most disliked vulnerability and/or what you hope to gain from this Learning Lab.

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Evaluating a Vulnerability

5Ws: Who, What, When, Where, Why

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Evaluating a Vulnerability with the 5Ws

- **Who** is discussing vulnerabilities?
  - Peers
  - Industry Experts
  - Government Advisories

Online discourse may include fear-mongering and hyperbole.

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Evaluating a Vulnerability with the 5Ws

- **What** is the exploitability?
  - Is it remotely exploitable?
  - Is exploit code public?
  - What is the impact of successful exploitation?

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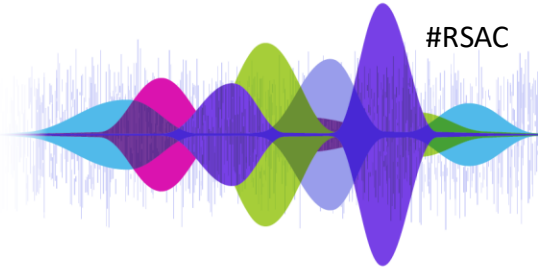
Evaluating a Vulnerability with the 5Ws

- **When** was it disclosed?
  - Was it a coordinated/responsible disclosure with a deadline to patch before public disclosure?
  - Is it actively exploited in the wild?
  - Was it exploited as a zero-day?

Evaluating a Vulnerability with the 5Ws

- **Where** does it exist in your environment?
  - Does it impact a software component listed in an SBOM or vendor advisory?
  - Is the impact of exploitation influenced by where the vulnerability is present in your environment?
  - Is it externally facing?
  - Is a patch available?

Evaluating a Vulnerability with the 5Ws



- Understanding the **Why**:
  - Does this vulnerability align with recent trends in adversary behavior?
  - Does it have a score, such as CVSS or EPSS?
    - These scores should not be the only factor in evaluating.
  - Is it listed in a database like the CISA KEV?

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Group Discussion

What would you add to the 5Ws or highlight based on past experiences?

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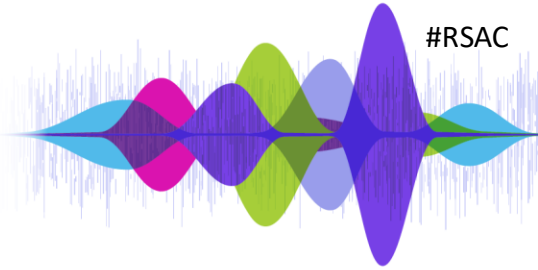
Case Study: MOVEit Transfer (2023)



- Impact:
  - 95.7M Individuals and 2,773 organizations (source: Emsisoft)
- Lessons learned:
  - Adversary behavior can inform our expectations about the likelihood of exploitation
  - Simple attack chain + zero-day = higher priority
  - Supply chain considerations

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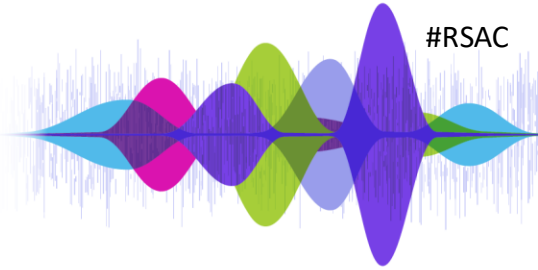
Case Study: Log4j (2021)

- Why this vulnerability was a high priority:
  - It was remotely exploitable.
  - It was publicly disclosed before a fix was available.
  - PoC exploit code circulated on the Internet.
  - Log4j is popular among Java developers and embedded into thousands of software packages and millions of systems worldwide.

Case Study: HAFNIUM/Exchange (2021)



- What happened:
  - Cyberespionage campaign targeting on-prem Exchange servers
  - Attributed to HAFNIUM, a China-nexus state sponsored threat group
- Lessons learned:
  - Consider the impact of downtime during the patching process
  - Patch gaps can lead to compromise (i.e., backdoors)

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Tabletop Exercise

Tabletop Exercise 1

CloudSync

- RCE vulnerability in CloudSync 5.2, a cloud storage synchronization service that is widely deployed in corporate environments, with ~2,000 Internet-exposed instances.
- Allows execution of arbitrary commands on affected servers by sending a specially crafted API request.
- High exploitability, requires no authentication or user interaction.
- Public disclosure by a third-party researcher overnight.
- No patch yet, but mitigations exist (disable vulnerable API endpoint).

HR IDOR

- An Insecure Direct Object Reference (IDOR) vulnerability exists in an HR portal used by ~2,500 small-to-medium businesses (SMBs).
- An attacker can modify the employee_id parameter in API requests to access confidential personal details and tax documents.
- Exploitability is relatively easy with knowledge of API requests.
- Reported by a researcher for coordinated disclosure with the vendor yesterday. A patch is available.
- Active exploitation observed in the wild.

Tabletop Exercise 2

SecurePay API

- Third-party payment processing API used by your e-commerce platform.
- API authentication bypass vulnerability to initiate fraudulent transactions using specially crafted API requests.
- Remotely exploitable, no authentication or user interaction required.
- 1,500+ businesses use this payment API.
- Privately reported by a researcher, but PoC exploit code leaked on a forum.
- Vendor is rolling out a patch in 48 hours, no immediate fix available.
- Mitigation: rate-limiting and API request monitoring can reduce risk but not prevent exploitation.

CoreX Hypervisor

- Your organization's virtualization platform hosts thousands of production workloads.
- Memory corruption vulnerability in the hypervisor allows a guest VM to escape and execute code on the host, leading to full server takeover.
- Requires chaining vulnerabilities, PoC exists.
- Allows for privilege escalation and possible compromise of entire cloud environments.
- 500+ critical production servers affected.
- Researchers released detailed overview of the exploit methodology.
- Patch available, but applying it requires rebooting all hypervisors, leading to potential service downtime.

Tabletop Exercise 3

VaultDB Privilege Escalation

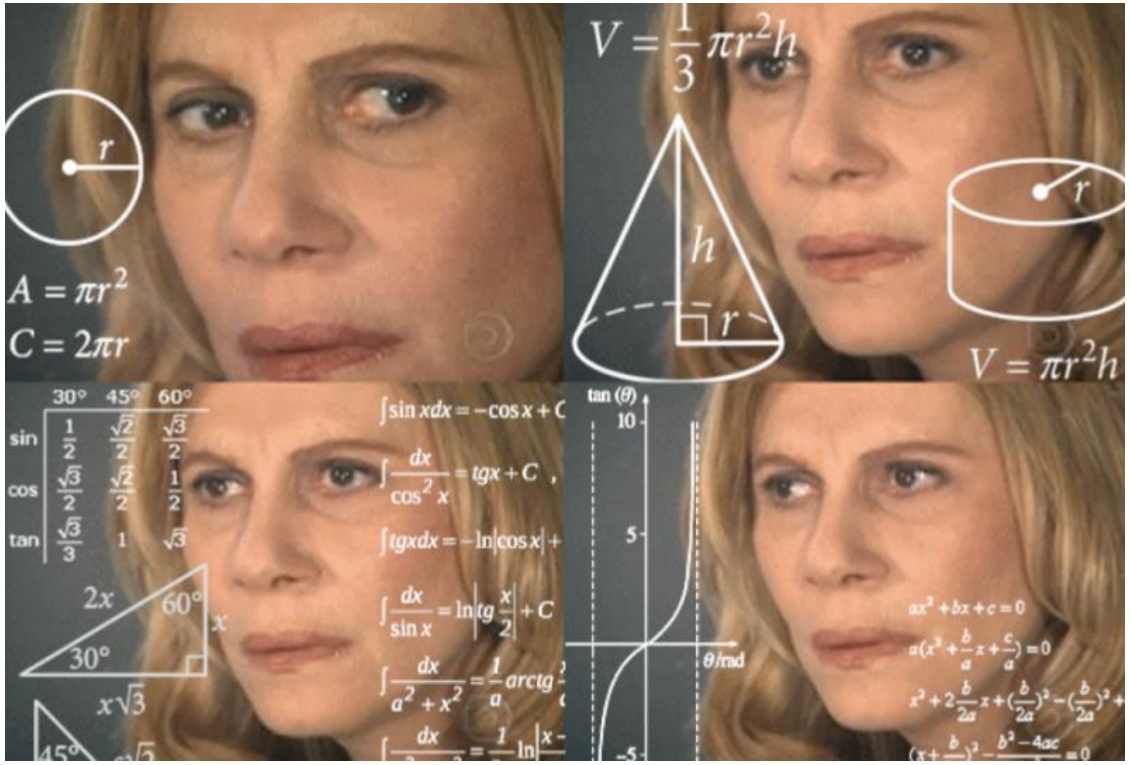
- Local privilege escalation via a misconfigured service that allows a low-privilege user to gain root access.
- Requires initial access but is trivial to execute once inside the network.
- Impact: full control over the database server.
- 500+ production database servers across multiple subsidiaries, none directly exposed to the Internet.
- Researcher reported the issue privately under coordinated disclosure.
- Patch available, but requires full database reboot, leading to downtime for critical operations.
- Workarounds exist but may introduce system instability.

WebPort SSRF Zero-Day

- Server-side request forgery (SSRF) allowing an attacker to manipulate API calls to gain unauthorized access to internal services.
- Can be exploited remotely without authentication but requires specific knowledge of the backend API structure.
- Impact: potential exposure of internal system metadata, limited access to internal services, possible lateral movement.
- 3,000+ internet-exposed instances.
- Public disclosure by third-party researcher.
- No patch available. Vendor estimates one week timeline.
- Mitigation: WAF rules can block most attack patterns, but bypasses are possible.

Databases and Scoring Methods

- CISA KEV
- NIST NVD
- CVE.ICU
- EPSS
- SSVC
- CSAF
- VEX
- Cisco VM
- OSV Schema
- OSS Index
- VulDB
- VISS
- The list goes on…



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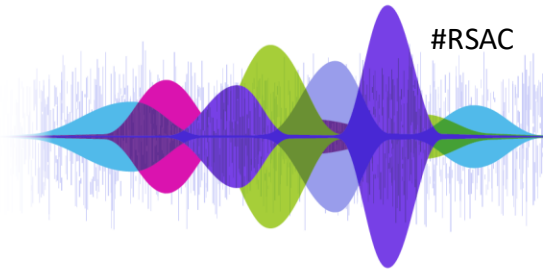
Apply What You Have Learned Today



- Next week you should:
  - Familiarize yourself with vulnerability databases and scoring methods.
- In the first three months following this presentation you should:
  - Study recent adversary behavior that could influence vulnerability exploitation (i.e., threat reports, advisories, cybersecurity news).
  - Evaluate patch management strategies to minimize downtime.
- Within six months you should:
  - Tailor your vulnerability management program to evaluate and prioritize vulnerabilities based on criticality and business context (the 5Ws).

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Thank you!